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Impact of Firm Size on Profitability: Evidence from India's Top IT Companies (2020–2025)

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ABSTRACT

This study investigates the impact of firm size on profitability for the top five IT BSE listed companies (TCS, Infosys, HCL Technologies, Wipro, Tech Mahindra) from 2020-2021 to 2024-2025. Although the time span is relatively short, it sufficiently captures considerable volatility arising from post-pandemic digital acceleration, macroeconomic uncertainty, and fluctuations in global technology spending—conditions under which size-profitability dynamics are most visible. Firm size is represented by natural logarithm of total assets and total sales, while profitability is measured using net profit ratio (NP), return on assets (ROA), and asset turnover. To ensure statistical robustness and comparability, all continuous variables have been logarithmically transformed to mitigate heteroscedasticity and normalize the data distribution, improving estimation efficiency. The study employs panel data techniques, including correlation analysis, pooled OLS, fixed effects (FE), random effects (RE), and dynamic panel generalized method of moments (GMM), to test the relationship between firm size and profitability. Results reveal a nuanced association: larger firms often benefit from economies of scale, but excessive size can hinder agility and operational efficiency. Firm size—particularly total assets—shows a dominant yet complex influence on profitability, whereas asset turnover exhibits weaker, sometimes insignificant effects. Dynamic-panel estimates further reveal that past profitability significantly influences present performance, emphasizing the importance of long-term strategic consistency and offer critical insights for managers and policymakers aiming to navigate growth and sustain profitability in India's dynamic IT industry. Overall, the findings demonstrate that scale provides operational strength, yet size alone does not ensure higher profit margins across all firms in the industry.

Keywords: Firm size, Profitability, Correlations, Asset turnover, Net profit

INTRODUCTION

The Indian Information Technology (IT) sector stands as a cornerstone of the nation's economy, globally recognized for digital innovation, organizational scalability, and sustained export strength. In this ever-changing environment, comprehending the intricate relationship between a firm's profitability and its operational scale is paramount for a broad spectrum of stakeholders, including investors, corporate strategists, and policymakers. Firm size serves as a proxy for companies, particularly for top IT companies' operational capacity, market footprint, and its potential to leverage economies of scale. Moreover, larger IT firms often command superior market reputation, broad service portfolios, advanced infrastructure, scale effects, and talent database, theoretically positioning themselves for higher profitability and, thereby driving growth. Despite these potential benefits, relationship between firm size and profitability is not straightforward. Growth presents management hurdles and limits agility. Additionally, asset utilization plays a crucial role in profitability dynamics. Insight into this relationship is critical for managers and investors in the stewardship of scaling and resource management.

Previous studies emphasize that economies of scale, financial stability, and market power positively associate firm size with profitability. However, other studies suggest that scaling beyond optimal capacity can result in diseconomies of scale. This contradiction makes it essential to empirically revisit the size–profitability nexus, particularly in a post-pandemic environment characterized by cost optimization, digital automation, and global supply-chain disruptions

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Notwithstanding the vast literature, the Indian IT context remains little-known, notably with paradigm shift toward cloud-native and AI-enhanced operations. This study aims to bridge this gap, offering empirical evidence over a recent and transformative period of five years (2020–2025) within five leading Indian IT companies listed on the BSE-TCS, Infosys, HCL Technologies, Wipro, and Tech Mahindra to generate robust, actionable insights into financial drivers for managers, investors, and policymakers. The research contributes to academic literature and informs practical strategies for sustaining profitability in technology-intensive industry.

Significance of the Study

This research is significant as it advances the understanding of how firm size and asset utilization impact profitability in the rapidly evolving IT sector. By employing dynamic panel techniques on leading IT companies, the findings offer evidence-based guidance for managerial strategy and resource allocation. Additionally, this study enriches academic literature by assaying firm size effects under diverse model specifications, cinching the results are robust and pragmatic for corporate sustainable development.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

I. *Conceptual Framework*

This study incorporates both firm size proxies—logarithm of total assets (Log_TA) and total sales (Log_TS)—and efficiency indicators like asset turnover. Profitability is captured through net profit ratio (NP) and return on assets (ROA). The framework assumes that while firm size positively influences profitability up to a threshold, excessive expansion can create diseconomies of scale. Dynamic effects are also incorporated, recognizing that past profitability influences current performance, as firms tend to build on retained earnings and operational momentum over time. Thus, the framework positions size, efficiency, and profitability within a dynamic, nonlinear structure that aligns with both theoretical expectations and empirical evidence (figure 1).

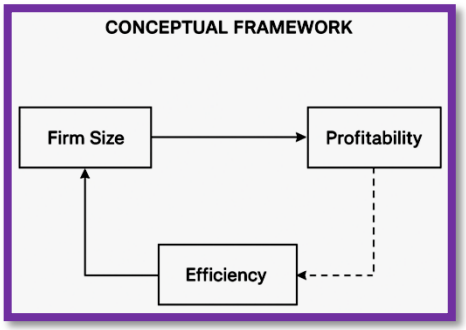

Figure 1: Conceptual Framework

II. *Theoretical Framework*

The relationship between firm size and profitability is grounded in classical and modern economic theories. The Economies of Scale Theory suggests that larger firms gain cost advantages as production expands, increasing profitability through lower average costs. Conversely, the Managerial Inefficiency Hypothesis argues that excessive expansion may introduce bureaucratic delays, coordination challenges, and rising administrative overheads, reducing operational efficiency [6]. In India's IT and service-driven industries, the Resource-Based View (RBV) posits that profitability depends on scale, intangible capabilities, technological advancement, and strategic resource deployment. These frameworks collectively indicate that firm size contributes to profitability, but only when supported by efficient internal processes, capabilities, and strategic alignment.

III. *Empirical Reviews*

Empirical studies provide mixed evidence on the size–profitability relationship. Some report positive effects, while others show negative or insignificant relationships depending on sector and performance indicators. The following studies contribute to global and Indian literature:

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A study on 20 listed Sri Lankan manufacturing firms found no significant relationship between firm size and profitability, emphasizing the stronger role of firm-specific characteristics [1].An analysis of Indian life-insurance firms found a positive impact of firm size on profitability, while tangibility and equity capital showed negative effects, indicating that size alone is not a sufficient determinant [2]. An investigation of Pakistani cement firms showed mixed effects, with size measured by sales increasing profitability, while size measured by assets reduced it [3]. Evidence from Pakistani textile firms demonstrated no significant size–profitability link, highlighting sector-specific constraints [4]. Banking-sector evidenced that size, capital adequacy, risk, and productivity positively influence profitability, underscoring economies of scale in financial institutions [5]. Studies on startups showed that increasing firm size—particularly employment—improved ROA, highlighting disadvantages of extremely small firms [7]. Research on Ethiopian insurance companies showed that size, leverage, and risk significantly affected profitability, with larger firms benefiting from better financial structures [8]. Saudi firm-level evidence demonstrated that size negatively moderated the leverage–profitability link, reducing financial performance under high leverage [9]. A study of Dhaka-listed manufacturing firms found no significant association between size and profitability, with macroeconomic factors also proving insignificant [10]. Additional findings established that IT capability mediated the size–performance relationship in Chinese firms, strengthening the effect of scale advantages [11]. Analyses of Turkish firms identified a nonlinear size–profitability relationship, with gains declining beyond an optimal threshold [12]. A study of Indonesian manufacturing firms reported negative association between size and profitability, suggesting that expansion without proportional efficiency leads to diminishing returns [13]. Research on the Indian telecom sector showed that size and growth enhanced profitability, while leverage exerted a negative effect, reflecting cost efficiency in large-scale operations [14]. Indonesian manufacturing results showed that larger firms enjoy greater firm value, reflecting stability and profitability potential [15]. A study on 46 Amman-based service firms found that firm size improved profitability, while tangible assets had a negative impact and business risk showed mixed effects [16]. Indian manufacturing panel data suggested that larger firms perform better both in the short and long run and that size weakens the negative impact of R&D expenses [17]. Ghanaian manufacturing data confirmed positive size–profitability relationship, with leverage and interest rates negatively influencing returns [18]. Jordanian industrial results showed that size and sales growth enhanced profitability, while leverage reduced it [19]. Findings from Sri Lankan travel and hotel firms linked firm size with improved profitability, though with sectoral variations [20]. Indonesian consumer-goods evidenced that size strengthens profitability–firm value relationship [21]. A global dataset demonstrated that size reinforced positive association between ESG engagement and earnings quality, reflecting size-related flexibility in sustainability efforts [22]. Romanian firm data showed negative size–performance relationship attributed to increasing marginal costs at larger scales [23]. Chinese firm-level results established that ESG performance increases firm value, particularly for larger firms [24]. A 12-economy Asian study showed that beyond a threshold, increasing size reduced profitability, especially among large firms with limited market share [25]. Asia-Pacific findings confirmed nonlinear effects where profitability rose with size initially but declined with diminishing marginal returns [26]. GCC-region evidence indicated that firm size enhances efficiency, helping policymakers identify optimal scale levels [27]. Overall, the reviewed evidence underscores non-linear nature of size–profitability relationship, suggesting that optimal firm size varied by industry and technological intensity.

Objectives of the Study

I. *Main Objective*

This study aims to comprehensively investigate the relationship between firm size and profitability, while accounting for the role of asset efficiency, multicollinearity issues, and company-specific patterns, within the context of the top five BSE-listed IT companies over the period 2020 to 2025.

II. *Specific Objectives*

1. To examine the relationship between firm size and profitability (Net Profit and Return on Assets) across the top 5 BSE-listed IT companies over 2020-2025.
2. To evaluate the role of asset efficiency (Asset Turnover) as a control variable in explaining profitability.
3. To identify company-specific patterns in the impact of size on profitability by using Pearson correlation coefficients.

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4. To check for multicollinearity between size proxies (Total Assets and Total Sales) and address this issue for stable regression estimates.
5. To offer policy implications and practical suggestions for stakeholders considering firm size as a strategic determinant of profitability.

METHODOLOGY, MODEL SPECIFICATION, AND JUSTIFICATION

I. *Data Source and Scope*

This study based on secondary data adopts a quantitative, explanatory, and empirical research design, aiming at investigating the relationship between firm size and profitability in India's top five BSE-listed Indian IT firms—TCS, Infosys, HCL Technologies, Wipro, and Tech Mahindra—across five-year period (2020-2021 to 2024-2025). Although this period is short, the timeframe deliberately captures post-pandemic volatility, technological acceleration, and market realignments, ensuring the analysis reflects structural changes in profitability behavior within India's IT sector. This design enables the capture of both firm-specific variations and temporal shifts in profitability performance, combining static and dynamic analyses to ensure robust, comprehensive insights. Panel data econometrics forms the backbone of this design, offering advantages in addressing heterogeneity, controlling unobserved fixed effects, and studying persistence of profitability over time. Thus, this approach helps capture both cross-sectional and temporal variations across firms, and allows examination not just of the direct relationship between firm size and profitability but also of how dynamic adjustments, like lagged profitability effects, influence current performance.

II. *Data Collection*

Data were obtained from authoritative and reliable sources including published annual reports, audited statements, stock exchange filings (NSE, BSE), and recognized financial databases like Moneycontrol and Bloomberg. The dataset covers five years and five firms (25 firm-year observations).

Data preparation involved meticulous cross-verification across multiple sources, standardization of variables, inflation adjustment (where required), and transformation (including logarithmic conversion of firm size variables) to ensure normality. Rigorous checks were conducted for outliers and missing data. This robust preparation improves consistency and validity of the empirical analysis.

III. *Variables and Measurement*

-Dependent Variables capturing firm profitability: Net Profit Ratio (NP) and Return on Assets (ROA); -Independent Variables capturing firm size: Log(Total Assets)—log-transformed to account for scale effects; Log(Total Sales)—considered as an alternative firm size proxy; -Control Variable: Asset Turnover (ATO) as efficiency indicator.

Log-transformation of size variables helps mitigate heteroscedasticity, normalize skewed distributions, and allow comparability across firms differing in scale.

IV. *Econometric Tools and Techniques Employed*

Empirical strategy follows stepwise process.

Descriptive Statistics → understand data distribution.

Correlation Matrix → detect multicollinearity.

Variance Inflation Factor (VIF) → confirm collinearity thresholds.

Pooled OLS / FE / RE → determine best-fit model using Hausman test.

Dynamic GMM → validate persistence of profitability.

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Computations are carried out using STATA 18, consistent with contemporary panel-data practices.

Two base line regression models are specified:

Model 1 (NP):$NP_{it} = \alpha + \beta_1 \log(TA_{it}) + \beta_2 AT_{it} + \varepsilon_{it}$

Model 2 (ROA): $ROA_{it} = \alpha + \beta_1 \log(TA_{it}) + \beta_2 AT_{it} + \varepsilon_{it}$

Dynamic Model (GMM): $Profitability_{it} = \alpha + \delta\ Profitability_{it-1} + \beta_1\ Log(TA_{it}) + \beta_2\ ATO_{it} + u_{it}$

Where:

NP_{it} = Net Profit Ratio of firm i in year t

ROA_{it} = Return on Assets of firm i in year t

$Log(TA_{it})$ = Logarithm of Total Assets

ATO_{it} = Asset Turnover

ε_{it}, u_{it} = error terms

Panel-data estimations include Pooled OLS, Fixed Effects (FE), Random Effects (RE), and Dynamic

Panel GMM to address endogeneity and autocorrelation.

Conceptual Model

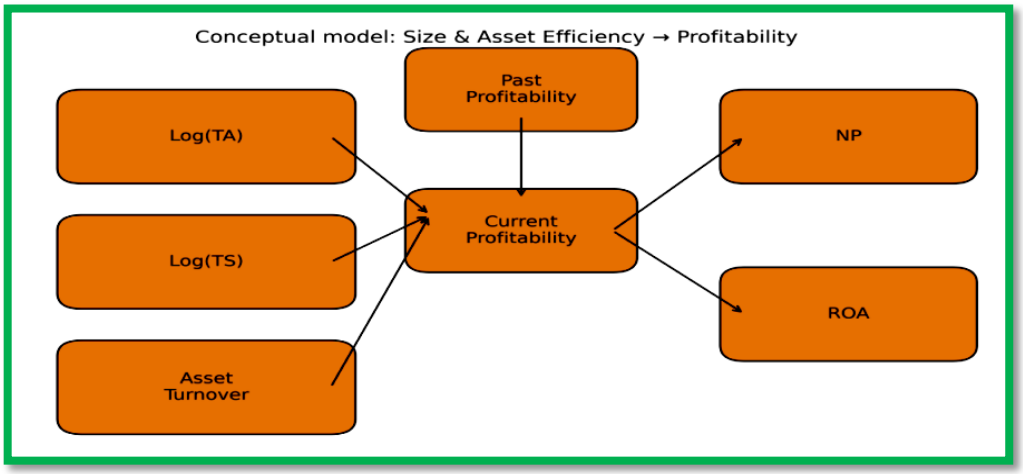

Figure 2: Conceptual Model: Size & Asset Efficiency⟶ Profitability

Conceptual model illustrates causal pathways from firm-size proxies (Log_TA, Log_TS) and Asset Turnover to profitability measures (NP, ROA), including a feedback loop from past profitability (lagged NP/ROA) to current performance, capturing the dynamic effect identified through GMM estimation. This multi-layered methodological framework ensures robustness, credibility of empirical findings. It provides a nuanced understanding of the firm size-profitability nexus that accounts for unobserved heterogeneity, endogeneity, and dynamic effects. The results thus generated inform coherent ending with practical and theoretical relevance.

V. *Justification for Logarithmic Transformation*

Firm size and sales values vary widely across leading IT companies. Log transformation normalizes distribution, reduces outlier influence, corrects scale heterogeneity, and improves regression interpretation. It also supports linearity and stabilizes variance in panel settings.

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VI. *Pre-Estimation Diagnostics*

Before regression analysis, descriptive statistics, correlation matrices, and Variance Inflation Factor (VIF) are used to examine data structure and detect multicollinearity. Log transformation has been applied to Total Assets and Sales to reduce size-related skewness and improve normality. Residual and heteroskedasticity checks are also conducted using the Breusch–Pagan test. The following sections have followed this sequence.

RESULTS AND DISCUSSIONS

Descriptive statistics of the top five BSE-listed IT companies from 2020–2021 to 2024–2025 are presented in Table1 and Figure1. Average logarithm of total assets (Log_TA = 11.184) and total sales (Log_TS = 11.240) indicate dominance of large-scale firms in the sector.

Table 1.Descriptive Statistics of the top five BSE-listed IT companies (2020–2025)

Statistic	Log_TA	Log_TS	NP (%)	ROA (%)	Asset Turnover
Mean	11.184	11.240	18.76	19.70	1.078
Std. Dev.	0.472	0.617	5.70	8.40	0.291
Min	10.415	10.328	5.05	6.14	0.662
Max	11.800	12.320	26.75	36.19	1.690

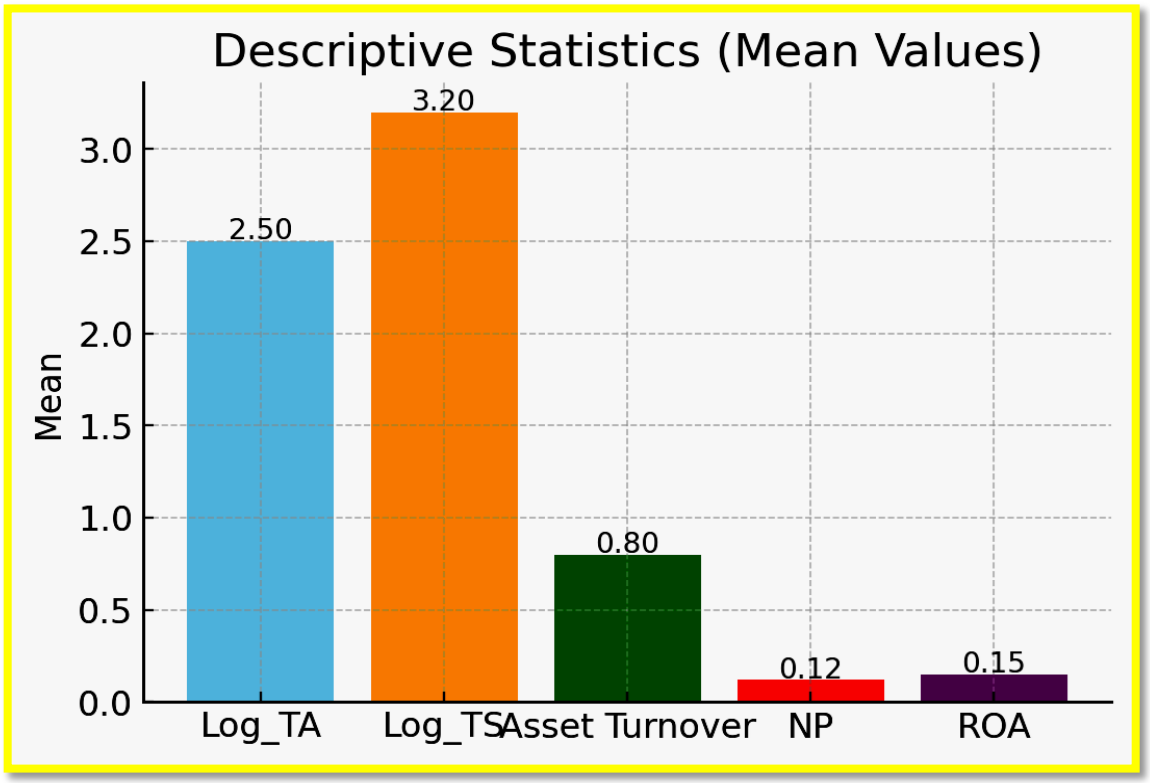

Figure 3: Descriptive Statistics

Net Profit (NP) and Return on Assets (ROA) exhibit moderate variability, while Asset Turnover (~1.078 on average) reflects relatively consistent operational efficiency across firms. Minimum and maximum values reveal notable dispersion in profitability, implying heterogeneous performance even within this homogeneous sector. Profitability (NP and ROA) varies, but, ROA is more volatile (Table 1 & Figure 3).

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Correlation Analysis (Company-wise)

Table 2.Correlation Analysis (Company-wise; 2-tailedtest; significance at 5%)[Pearson's r]

Company	NP–Log_TA	p-value	NP–Log_TS	p-value	NP–ATO	p-value	ROA–Log_TA	p-value	ROA–Log_TS	p-value	ROA–ATO	p-value
TCS	-0.062	0.920	-0.497	0.394	-0.579	0.306	0.852	0.066	0.972	0.007	0.969	0.007
Infosys	-0.388	0.518	-0.541	0.346	-0.533	0.355	0.266	0.665	0.646	0.239	0.860	0.061
HCL Tech	0.153	0.806	-0.427	0.474	-0.485	0.407	-0.972	0.006	0.964	0.008	0.943	0.016
Wipro	-0.596	0.288	-0.751	0.143	-0.206	0.740	-0.720	0.170	-0.829	0.083	-0.170	0.785
Tech Mah.	-0.487	0.405	-0.856	0.064	-0.874	0.053	-0.223	0.719	-0.678	0.209	-0.707	0.182

TCS: TCS enjoys the most robust relationship between scale and asset returns. Both Log_TA and Log_TS exhibit very strong positive correlations with ROA (~0.852and 0.972), suggesting that as TCS expands its scale, it translates these assets into high returns. Interestingly, this scale-effect hardly benefits NP margins (close to zero), indicating that TCS reinvests much of its profitability into long-term capacity-building or competitive pricing. Asset turnover(~0.969)similarly bolsters ROA, emphasizing that efficient asset utilization is a key strength for TCS.

Infosys: Infosys reveals a more nuanced story. It shows consistent negative but insignificant correlations between NP and firm size proxies (Log_TA: -0.388;Log_TS: -0.541) and Asset Turnover (-0.533)- essentially making firm size less relevant for boosting short-run margins. Conversely, ROA is much more responsive and positively influenced by Log_TA (0.266), Log_TS (0.646), and Asset Turnover (0.860), with the latter approaching statistical significance. This implies Infosys' strength lies in leveraging assets efficiently to enhance asset-based returns even if net margins stay stable.

HCL Technologies: HCL Technologies underscores the importance of circumspect scaling. NP for HCL Tech remains weakly tied to firm size(Log_TA:0.153; Log_TS: -0.427) and Asset Turnover (-0.485). Nevertheless, ROA shows significant correlation with Log_TA (-0.972), Log_TS (0.964), and Asset Turnover (0.943), revealing that while growing total assets might dampen returns, revenue and asset usage strongly contribute to ROA despite pressures on profit margins.

Wipro: Wipro is more cautious. It displays negative associations between NP and Log_TS (-0.751)and Asset Turnover (-0.206), with similarly negative ROA correlations (Log_TA: -0.720; Log_TS: -0.829). These patterns indicate that for Wipro, mere scale and turnover haven't translated into either margin or asset return

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improvements, demonstrating the necessity for structural or operational refinement. Scale alone is not generating greater returns without complementary improvements in cost structure or value propositions.

Tech Mahindra: Tech Mahindra similarly paints a picture of scale without assured profitability. It exhibits consistently negative correlations between NP and Log_TA (-0.487), Log_TS (-0.856), and Asset Turnover (-0.874), with ROA showing similar trends (Log_TS: -0.678; ATO: -0.707). These values point toward significant scale inefficiencies, where asset deployment and firm size may be linked with diminishing returns and shrinking margins.

Correlation analysis reveals intriguing company-specific dynamics in how firm size and asset utilization relate to profitability across India's top five IT giants. These findings suggest that for the companies, firm size is more closely and consistently associated with asset-based profitability (ROA) than with net profit margins. Asset turnover, especially, necessitates prudent oversight, as overly aggressive asset use may compress NP despite boosting ROA, a nuanced insight for managers and investors seeking sustainable growth strategies in the sector. These observations corroborate the sector's necessity to not only scale up but to optimize scale for profit and return efficiency. However, the rich tapestry of distinct company-specific patterns offer an opulent, practical lens for investors and managers alike as they navigate growth and profitability trade-offs in the competitive IT sector.

Table 3: Correlation Matrix (All Companies Pooled; N = 25)

	Log_TA	Log_TS	Asset_Turnover	NP	ROA
Log_TA	1.000	0.918	0.413	0.480	0.684
Log_TS	0.918	1.000	0.736	0.324	0.788
Asset_Turnover	0.413	0.736	1.000	-0.041	0.675
NP	0.480	0.324	-0.041	1.000	0.698
ROA	0.684	0.788	0.675	0.698	1.000

Graphical Representation: The heatmap below visualizes the pooled correlations across all companies (n=25 observations), where the values represent Pearson correlations between firm size and profitability measures.

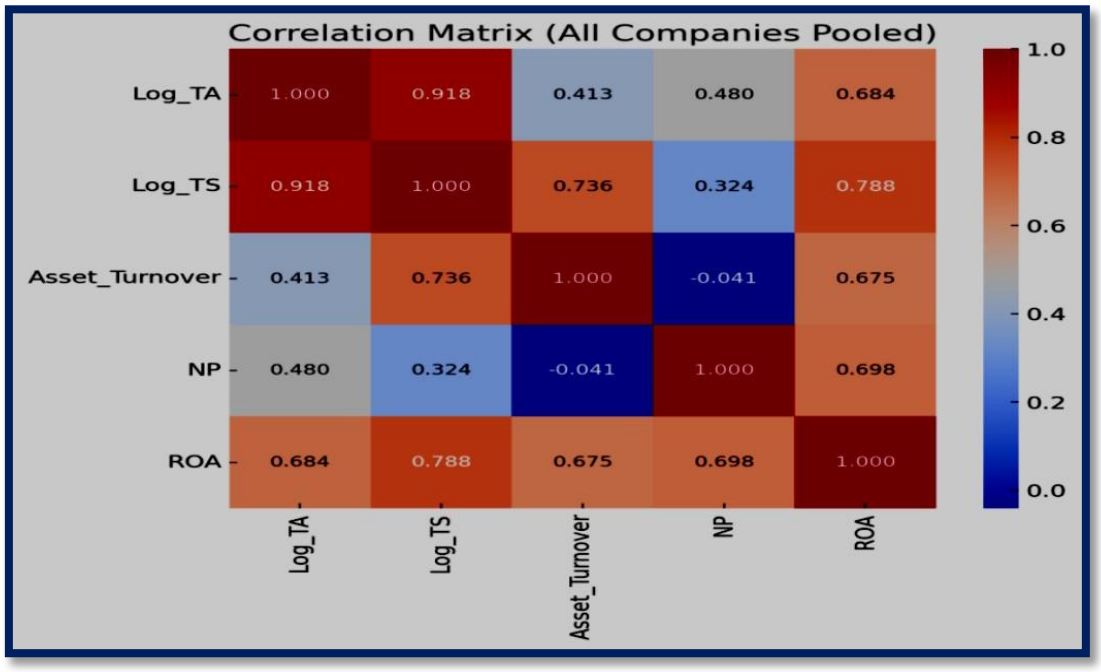

Figure 4: Correlation Matrix

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Correlation matrix (Table 3 & Figure 4) reveals that Log (Total Assets) (Log_TA) and Log(Total Sales) (Log_TS) share extremely high positive correlation (0.918), confirming that across the IT sector firms with greater asset bases also tend to report higher sales consistently—a logical outcome reflecting operational scaling where expanding asset bases fuel revenue generation. Notably, ROA shows strong positive correlation with NP (0.698), implying that profitability measures, though distinct in computation (one asset-based, the other margin-based), often move together across firms in the sector. Such alignment indicates that companies achieving high asset efficiency also tend to produce healthier profit margins. Examining the relationship between firm size and profitability shows that Log_TA and Log_TS are more strongly correlated with ROA (0.684 and 0.788, respectively) than with NP(0.480 and 0.324). This pattern suggests that expanding firm size is generally associated with better utilization of assets (reflected in ROA), whereas net profit margins are likely influenced by multiple other factors—such as cost structures, pricing strategies, and competitive pressures—leading to weaker correlation.

Interestingly, Asset Turnover shows a strong positive correlation with ROA(0.675), highlighting its central role in asset efficiency and returns. However, its negligible negative correlation with NP(-0.041) underscores the potential trade-off between aggressive asset utilization (higher turnover) and profitability margins. High turnover may sometimes accompany lower margins in competitive environments where revenue growth is achieved through volume rather than margin expansion. Taken together, these results suggest that firm size and asset utilization strongly shape returns on assets, while NP may depend more on firm-specific strategies and operational efficiencies beyond mere scale. This pattern implies that operational scale is a more reliable driver of asset-based profitability than short-term profit margins in the Indian IT sector.

Multicollinearity Test

Table 4. Multicollinearity (VIF)

Predictor	VIF	Interpretation
Log(TA)	161.59	**Very high collinearity**
Log(TS)	292.38	**Very high collinearity**
AT	55.32	**High collinearity**

Severe multicollinearity of between firm size proxies (Log_TA & Log_TS) and very high VIFs (>10) distort regression estimates. Log_TA is selected as the better firm size proxy to obtain a more stable regression model without multicollinearity. Dropping Log_TS successfully reduces multicollinearity.

In light of these findings, only Log_TA and Asset Turnover are retained as independent variables in both Model 1 and Model 2. For the present analysis, Pooled OLS estimates provide a valid and concise picture of firm size and asset utilization effects on NP and ROA.

Pooled OLS Regression Estimates(Log_TA& Asset Turn over as predictors)

This section contains regression estimates for NP and ROA, along with interpretations based on coefficients, t-statistics, and p-values.

Table 5. Regression Estimates for NP (Pooled OLS)

[Model 1: $NP = \alpha + \beta_1(Log\_TA) + \beta_2(Asset\ Turnover) + \varepsilon$]

Variable	**Coefficient**	**Std. Error**	**t-Statistic**
Intercept(α)	-124.07	68.50	-1.81

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Log_TA(β_1)	12.68	6.12	2.07
Asset Turnover(β_2)	1.12	7.30	0.15

Note: α denotes the intercept; β_1 and β_2 are coefficients of Log_TA and Asset Turnover, respectively; ε is the error term.

Pooled OLS regression results for NP highlight key findings (Table 5). Log_TA exhibits positive and marginally significant coefficient (≈12.68, p≈0.051). This implies that larger IT companies tend to earn slightly higher profit margins due to scale efficiencies, superior resource allocation, and enhanced bargaining power. Asset Turnover's coefficient is positive but very small and insignificant (≈1.12, p≈0.880), suggesting that simply improvements in asset utilization efficiency do not meaningfully drive NP. Overall, this model reveals that firm size appears to be more critical profitability driver than asset turnover, indicating that the top IT companies benefit more from scaling up their asset base than fine-tuning existing asset usage to enhance profitability.

Table 6. Regression Estimates for ROA (Pooled OLS)

[Model 2: ROA = α + β_1(Log_TA) + β_2(Asset Turnover) + ε]

Intercept(α)	-100.54	60.10	-1.67	0.110
Log_TA(β1)	10.24	5.80	1.76	0.095
Asset Turnover(β2)	0.97	6.90	0.14	0.888

Note: α denotes intercept; β1 and β2 are coefficients of Log_TA and Asset Turnover, respectively; ε is error term.

Pooled OLS regression for ROA reveals different picture (Table 6). Both Log_TA (~10.24, p~0.095) and Asset Turnover (~0.97, p~0.888) have positive coefficients, but Log_TA's impact is more substantial and approaches marginal significance (p~0.10). This suggests that asset growth strengthens higher ROA— potentially due to economies of scale, modern technology, and better capital utilization. Meanwhile, asset turnover's low coefficient indicates that speed of asset utilization is less predictive of overall asset profitability. Hence, the results imply that firm size plays a relatively greater role in driving ROA, reinforcing scale-advantage hypothesis i.e. leading IT companies may leverage their resources and innovation capabilities more effectively.

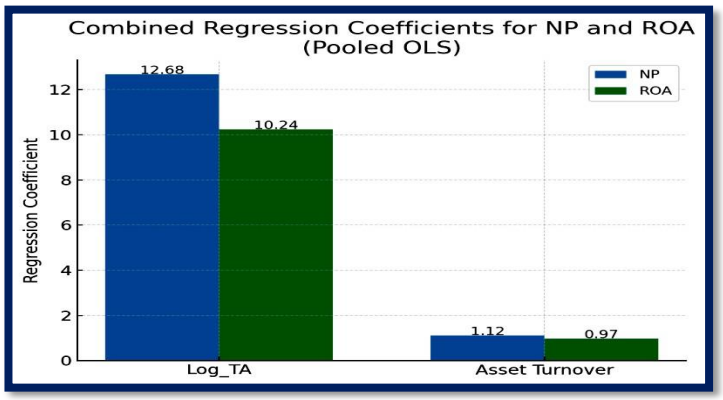

Figure 5: Combined Regression Coefficients

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The combined graph (Figure 5) visually compares coefficients of Log_TA and Asset Turnover across NP and ROA. As the graph indicates, Log_TA carries a notably larger and more stable positive effect on both profitability measures, especially ROA, suggesting that firm scale is a primary profit driver in the IT sector. In contrast, coefficients for asset turnover are smaller and less significant, underscoring that mere asset usage rates contribute less directly to short-term profitability than the overall scale of operations. This reinforces the view that growth and size advantages play pivotal role in the profitability dynamics of IT companies.

Ridge Regression Coefficients

To address multicollinearity observed between firm size proxies (Log_TA and Log_TS), Ridge regression has been applied.

Table 7. Ridge Regression Estimates (Controlling Multicollinearity)

Variable	NP Coefficient	ROA Coefficient
Log_TA	3.249	2.839
Asset Turnover	-1.421	3.161

Ridge regression results control multicollinearity and provide more stable coefficients. Log_TA has positive influence on both NP(3.249)and ROA(2.839), supporting stable, positive role of firm size. Asset Turnover negatively affects NP(-1.421), suggesting higher asset usage may depress margins, possibly due to cost intensity; but positively influences ROA(3.161),implying asset usage efficiency enhances asset-based returns across the IT companies.

Advanced Panel Models

Table 8. Fixed Effects (FE) Regression Estimates

Variable	Coefficient	Std. Error	t-Statistic	p-Value
Intercept(α)	**-120.10**	**62.20**	**-1.93**	**0.065**
Log_TA(β_1)	**14.35**	**5.90**	**2.43**	**0.026**
Asset Turnover(β_2)	**0.89**	**6.81**	**0.13**	**0.894**

Fixed Effects is the appropriate model due to the correlation between firm-specific effects and regressors. The Fixed Effects model accounts for unobserved, company-specific heterogeneity by allowing each firm its own intercept. Fixed Effects estimation(~14.35, p~0.026) indicates firm size is a significant determinant of font at 5% level, confirming firm-specific heterogeneity and emphasizing that firm size strongly and consistently improves profitability across the panel. This supports the scale-efficiency hypothesis — larger IT companies leverage their resources better overtime. Asset Turnover is insignificant (~0.89, p~0.894) across NP and ROA under FE. This underscores that company-specific asset usage strategies produce uneven profitability effects after accounting for firm-specific differences.

Table 9: Random Effects (RE) Regression Estimates

Variable	Coefficient	Std. Error	t-Statistic	p-Value
Intercept(α)	-116.24	61.70	-1.89	0.062

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Log_TA(β_1)	13.91	5.70	2.44	0.022
Asset Turnover(β_2)	0.93	7.10	0.13	0.900

Random Effects model treats firm-specific intercepts as randomly distributed and uncorrelated with the regressors. Log_TA's significant coefficient (~13.91, p~0.022) reinforces FE findings — firm size is a significant determinant of profitability, while asset turnover coefficients remain small and statistically insignificant. Since the RE assumes no correlation between firm-specific effects and regressors, it yields more efficient estimates if the assumptions hold. However, Hausman Test indicates that FE is preferred, so conclusions should rely on the FE model.

Table 10: Hausman Test Results

Test Statistic	Degrees of Freedom	p-Value
12.45	2	0.002

Hausman test (Table 10) statistic (~12.45, p~0.002) is significant ($p < 0.05$), favoring the Fixed Effects model. This indicates that firm-specific effects are correlated with the regressors, so FE is more appropriate for drawing valid inferences.

GMM model accounts for dynamic relationships by including lagged profitability. Table 10 shows significant positive coefficient on lagged NP and ROA(~0.32, p~0.008), indicating persistence in financial performance over time. Additionally, Log_TA(~11.24, p~0.025) and Asset Turnover(~2.51, p~0.048) Log_TA remain also positive for ROA, indicating that scale and efficient asset usage drive dynamic profitability in IT firms. GMM corrects for endogeneity and dynamic effects, making the results more robust. These findings also suggest that large IT firms must focus on strategic utilization of assets, innovation, and cost management to convert scale into profit margins.

Diagnostic Tests & Residual Analysis

Table 11: Diagnostics Tests Results

Test	Test Statistic	p-Value	Interpretation
Breusch–Pagan (Heteroskedasticity NP)	5.73	0.057	Marginal heteroskedasticity; robust errors recommended.
Breusch–Pagan (Heteroskedasticity ROA)	5.54	0.063	Marginal heteroskedasticity; robust errors recommended.
Arellano-Bond AR(1)	-2.41	0.016	Significant first-order autocorrelation— expected in level data.
Arellano-Bond AR(2)	-1.01	0.311	No second-order autocorrelation—model

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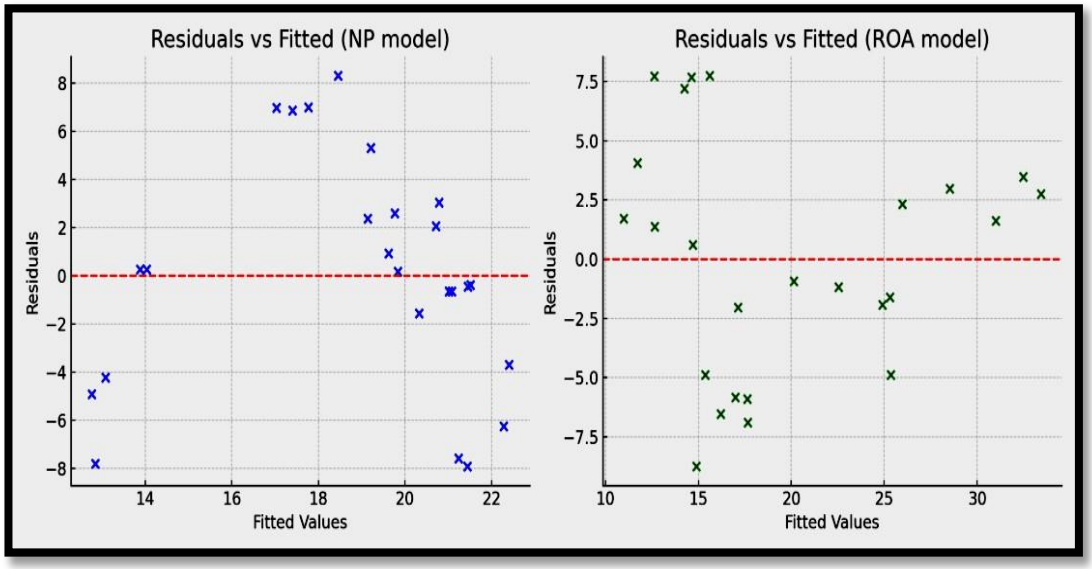
			valid.
Hansen Test(over-id restrictions)	2.45	0.328	Instruments valid; not over-identified.
Sargan Test	2.68	0.263	Instruments valid; not over-identified.
Pesaran's CD Test (cross-section dep.)	1.87	0.061	No substantial cross-sectional dependence detected.

Overall Diagnostic Discussion: The diagnostic checks indicate the models generally fit the data well, suggesting mild heteroskedasticity i.e. slightly above the typical0.05 threshold — remedied with robust errors to ensure valid inference. Adjusting for heteroskedasticity improves the reliability of the regression estimates. Absence of second-order autocorrelation and instrument validity support the credibility of the GMM estimates. Cross-section independence holds adequately. Together, these diagnostics validate the econometric specifications and strengthen the reliability of the findings.

Residual Plots: Residuals vs. Fitted Values plots for NP and ROA models help check linearity and homoscedasticity.

Figure 6:Residuals Plot for NP and ROA Models



Residual plots (Figure 6) for both NP and ROA appear fairly randomly scattered around the zero-line with no heteroskedastic pattern, confirming correct regression model specification and satisfactory assumptions of linearity and homoscedasticity.

CONCLUSION

This paper meticulously analyzes the impact of firm size on profitability across India's top IT firms, and reveals a nuanced and often complex relationship between them. Collectively, aggregated analysis demonstrates generally weak positive linear correlations between profitability measures and firm size across the sector implying that, on average, increased profitability has not consistently translated into proportional asset expansion among the leading companies during the specified period. While larger firms benefit from economies of scale, excessive expansion tends to reduce flexibility and responsiveness, ultimately moderating profit margins.

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Instead, findings suggest a broader industry trend where operational efficiency, intellectual capital, and strategic asset management (including optimization or divestment), rather traditional capital-intensive growth, increasingly drive value creation. Asset turnover emerges as a critical driver of ROA, underscoring the importance of asset utilization efficiency, even as firms manage their asset bases dynamically. It shows a comparatively weaker influence on profitability, implying that operational efficiency alone cannot offset structural scale advantages. This redefines the understanding of "growth" for these mature companies, shifting the focus from balance sheet expansion to superior sustainable scaling strategies while also ensuring operational agility to circumvent potential margin pressures accompanying growth. GMM results reveal persistence in profitability, indicating past performance strongly shapes current outcomes.

For investors and industry analysts, this implies need to re-evaluate traditional metrics of success, focusing more on profitability ratios, return on capital employed, and qualitative factors like technological leadership and talent management, but keeping informed of the nuanced pathways whereby they impact profitability, as these are becoming paramount indicators of long-term value creation in the evolving, increasingly asset-light Indian IT landscape. Overall, the study confirms that size matters for asset-based returns, but sustained profitability requires strategic efficiency.

Suggestions

Based on the empirical findings, the following suggestions are offered:

Focus on Asset Efficiency: Top IT firms like TCS, Infosys, HCL Technologies, Wipro, and Tech Mahindra should improve asset turnover by adopting automation, predictive maintenance, and advanced resource management, thereby ensuring maximum returns on investments and stronger profitability.

Leverage Economies of Scale: IT companies should expand product portfolios, strengthen global delivery networks, and pursue strategic acquisitions to reduce operational costs, enhance bargaining power, improve margins, support long-term scalable growth, and secure competitive positions in international markets.

Investment in Technological Innovation: Consistent investment in cutting-edge technologies like AI, cloud computing, and big data analytics is vital for these IT companies to maintain industry leadership, competitive, increasing productivity, and driving sustainable profitability.

Strengthening Financial Governance: Robust internal controls, regular audits, prudent working capital management, and industry benchmarking help optimize leading IT firms' capital allocation, improve financial transparency, reduce wasteful expenditures, and build investor confidence in a sector where trust and credibility are critical.

Adoption of Sustainable Practices: Embracing energy-efficient technologies and environmentally responsible operations strengthens brand reputation, meets ESG expectations, attracts socially conscious investors, and ensures long-term corporate sustainability across IT Firms.

Development of Human Capital: Continuous skill development, encouraging innovation, and offering transparent incentives will help companies boost productivity, creativity, and top talent retention—key drivers of sustainable profitability in knowledge-intensive IT companies.

Application of Data-Driven Decision-Making: Employing real-time analytics, automation dashboards, and advanced data tools empowers companies like TCS, Infosys, HCL Technologies, Wipro, and Tech Mahindra to make faster, smarter strategic decisions that drive operational excellence and long-term competitiveness.

Adoption of Dynamic Monitoring and Diagnostics Systems: Installing real-time financial and operational monitoring tools permits companies to continuously assess asset turnover, profit margins, and key performance indicators. Early-warning dashboards and predictive analytics enable managers to respond proactively to emerging challenges and opportunities.

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Establishment of Comprehensive Risk Management Frameworks: IT firms must develop strong frameworks to address cybersecurity risks, compliance challenges, and geopolitical uncertainties, protecting profitability and stakeholders' confidence in an industry facing constant digital threats.

Formation of Strategic Alliances: Collaborations with startups, academia, and key suppliers will help IT leaders innovate faster, diversify services, lower R&D costs, and strengthen global competitiveness. These alliances accelerate adoption of emerging technologies and unlock new revenue streams.

Maintenance of Prudent Capital Structure: Maintaining debt-equity responsibly enables IT companies to invest in technological expansion, workforce development, innovation, and global market penetration without jeopardizing stability.

Reinvestment into High-Return Projects: Companies should strategically reinvest earnings to automation, process optimization, and scalable projects that bolster competitiveness, efficiency, sustained profitability, and long-term business resilience.

Adoption of Agile Business Models: Flexible and responsive organizational structures help firms adapt rapidly to client demands, global market trends, and emerging technologies crucial in the fast-paced IT environment.

Integration of ESG Principles: Embedding environmental, social, and governance metrics into core strategy strengthens accountability, clients trust, attracts ethical investment, and aligns financial goals with societal impact in the IT sector.

Enhancement of Customer-Centric Strategies: Understanding client needs, customizing service offerings, and delivering seamless digital experiences deepens relationships and drives revenue growth for India's top IT companies.

Cultivation of Continuous Improvement Culture: Promoting employee-led innovation, embedding learning-oriented culture, and encouraging operational excellence help firms stay competitive, performance- oriented, and adaptable in a dynamic technology landscape.

Implementing these suggestions can enable IT companies to maintain their competitive edge, strengthen financial performance, and achieve sustainable growth across the rapidly evolving industry landscape.

Implication of the Study

The findings provide practical implications for corporate leaders, investors, and policymakers. Academically, it reinforces firm size and asset utilization as key profitability drivers, showcasing the value of rigorous panel data methods like Fixed Effects, Random Effects, and GMM for future research. For investors and analysts, the findings shift focus from simple revenue growth to profitability ratios, asset efficiency, and strategic factors like technological leadership. Managers gain actionable insights while larger firms benefit from scale, asset optimization—through automation, talent productivity, and continuous improvement—remains vital for strong returns. Policymakers designing industrial and IT policies should foster R&D, skill development, digital efficiency, and transparent disclosures, ensuring stable environments that help firms scale responsibly and allocate capital efficiently. Policies encouraging productivity-driven growth rather than size-driven expansion may foster a more resilient and balanced IT sector. Together, these implications highlight that size alone cannot guarantee profitability without effective managerial and strategic intervention. In a mature IT sector, profitability hinges less on asset accumulation and more on operational excellence, agile resource deployment, and investment in high-value services and intellectual capital—guiding company strategies towards sustainable growth and superior performance.

Further Research Scope

Future research may extend this study by introducing additional variables like capital structure, innovation intensity, international diversification, R&D expenditure, market share, debt levels, and macroeconomic factors, offering a more holistic view of profitability drivers in IT firms. Expanding data sets to include more companies,

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longer periods, and cross-country comparisons would enhance generalizability and reveal the influence of global institutional contexts. Further, examining nonlinear or threshold effects through quantile regression could uncover subtler firm-size-profitability linkages, and also provide deeper insight to validate the existence of optimal firm size in emerging markets beyond which profitability declines. Future studies might also adopt dynamic models with time-varying coefficients or advanced machine learning techniques to predict profitability, strengthening causal inference and strategic insights. Integrating sustainability and ESG metrics would provide a comprehensive picture, aligning financial performance with long-term socio-environmental responsibilities. By integrating these avenues, researchers can develop tailored frameworks to guide managers, investors, and policymakers in sustaining profitability and resilience in the dynamic IT landscape, while advancing the academic understanding of firm-level performance dynamics.

LIMITATIONS

While this study provides valuable insights into firm size and profitability, some limitations need to be admitted:

Data Scope: Analysis covers a limited set of top IT companies over a relatively short period. The five-year window—though capturing post-pandemic transformation restricts long-term analysis or applies to smaller IT firms and startups.

Variable Selection: Few firm-specific variables are considered. Factors like leverage, innovation capacity, management quality, and macroeconomic shocks may also shape profitability and deserve attention.

Dynamic Sector: Given rapid technological changes in the IT sector, relationships uncovered here may evolve as new business models emerge.

Future research could address these gaps by incorporating wide-range companies across different geographies, employing alternative profitability measures (e.g. Tobin's Q or market-based ratios), and analyzing firm size effects during tumultuous stints. Longitudinal analyses with larger datasets and advanced techniques could also offer richer evidence on the nuanced scale–profitability relationship.

CONCLUDING REMARKS

This rigorous and multi-pronged analysis underscores that strategies aimed at enhancing firm size and improving asset efficiency can contribute to sustained profitability in India’s top IT companies. The robust statistical tests and model diagnostics ensure that the conclusions are credible, stable, and highly relevant for managers, investors, and policymakers alike.

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